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| EXAMINER |
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HOGAN, MARY C

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| ART UNIT | PAPER NUMBER |
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2123

DATE MAILED: 10/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

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|------------------------------|--------------------------------------|--|--|
| Office Action Summary | Application No. 09/927,861 | Applicant(s) FRANKE, TORSTEN | |
| | Examiner Mary C Hogan | Art Unit 2123 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>8/10/01, 11/15/02</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This application has been examined.
2. **Claims 1-8** have been examined and rejected.

Specification

3. The disclosure is objected to because of the following informalities. Appropriate correction is required.
4. The disclosure is objected to because it contains embedded hyperlinks and/or other form of browser-executable code (**pages 1 and 2**). Applicant is required to delete the embedded hyperlink and/or other form of browser-executable code. See MPEP § 608.01.

Claim Objections

5. **Claims 1 and 2** are objected to because of the following informalities. Appropriate correction is required.
6. **Claim 1** recites the terms “first points”, “second points”, “entity”, and “subjected to the first entity” however, it is unclear from the claim language and the specification what these terms mean.
7. **Claim 2** recites the term “accessing”, however since this term is defined as “to obtain access to” (The American Heritage College Dictionary, page 8), it is unclear what the claim is referring to.

Claim Interpretation

8. **Claim 1** recites the terms “first points”, “second points”, and “entity”, however, it is unclear from the claim language and the specification what these terms mean. The claim was interpreted as “entity” being some variable and “points” being a point or node on a model. “Subjected to the first entity” was interpreted to mean that the point on the model is a point used to define the value of the “entity” or variable at that particular point in the model.
9. **Claim 2** recites the term “accessing”. This was interpreted to mean that the first matrix and second matrix are read from the memory or storage location of the simulation system.

35 USC § 101

10. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

11. **Claims 1-8** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter, or otherwise, lacks patentable utility.

12. An invention, which is eligible for patenting under 35 U.S.C.101, is in the useful arts when it is a machine, manufacture, process or composition of matter, which produces a concrete, tangible, and useful result. The fundamental test for patent eligibility is thus to determine whether the claimed invention produces a **useful, concrete and tangible result**. The test for practical application as applied by the examiner involves the determination of the following factors:

(1) Useful- The Supreme Court in *Diamond v. Diehr* requires that the examiner look at the claimed invention as a whole and compare any asserted utility with the claimed invention to determine whether the asserted utility is accomplished. Applying utility case law the examiner will note that:

(a) the utility need not be expressly recited in the claims, rather it may be inferred.

(b) if the utility is not asserted in the written description, then it must be well established.

(2) Tangible - Applying *In re Warmerdam*, 33 F.3d 1354, 31 USPQ2d 1754 (Fed. Cir. 1994), the examiner will determine whether there is simply a mathematical construct claimed, such as a disembodied data structure and method of making it. If so, the claim involves no more than a manipulation of an abstract idea and therefore, is nonstatutory under 35 U.S.C. 101. In

Warmerdam the abstract idea of a data structure became capable of producing a useful result when it was fixed in a tangible medium which enabled its functionality to be realized.

(3) Concrete- Another consideration is whether the invention produces a concrete result. Usually, this question arises when a result cannot be assured. An appropriate rejection under 35 U.S.C. 101 should be accompanied by a lack of enablement rejection, because the invention cannot operate as intended without undue experimentation.

13. Furthermore, although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

14. **Claims 1-8** are rejected under 35 U.S.C. 101 because the claimed subject matter describes an abstract idea for solving mathematical equations without a requirement for physical computing equipment. Thus, the claimed invention further fails to reside within the technological arts. **Claims 1-8** dictate and abstract idea, and therefore, constitute non-statutory subject matter.

Claim Rejections - 35 USC § 102

15. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

16. **Claims 1,2,7 and 8** are rejected under 35 U.S.C. 102(b) as being anticipated by Schwarz et al, (Schwarz et al, "Behavioral Modeling of Complex Heterogeneous Microsystems", Proceedings of the 1st International Forum on Design Languages (FDL '98), Volume 2, pages 53-62, September, 1998), herein referred to as **Schwarz**.

17. As to **Claim 1**, **Schwarz** teaches: a method for creating a database for carrying out a simulation, comprising:

- a) defining first points, which are subjected to a first entity (**page 59, Figure 12, and the first set of matrix equations**) in which the endpoints are first points subjected to a first entity, the external forces, E,
- b) defining second points, with a second entity as the output variable (**page 59, Figure 12 and the first set of matrix equations**) where the points are again the endpoints and the second entity is v or the displacement in a given direction, the second points being subdivided into a first subset and a second subset (**page 59, Figure 12 and the first set of matrix equations**) where the first and second subsets are 1 and 2 in the v matrix, and the second points of the first subset being subjected to the first entity (**page 59, Figure 12 and the first set of matrix equations**) where the second points of the first subset, $v_{11}-v_{n1}$ are subjected to the first entity, E, by multiplication,
- c) determining the transfer functions between one of the first points and one of the second points in each case, by a first simulation program (**page 59, first set of matrix equations, page 57, section 4.1**) where K is multiplying the v matrix, and where an FEM solver is the first simulator,
- d) storing a first matrix with the transfer functions between the first points and the second points of the first subset and storing of a second matrix with the transfer functions between the first points and the

second points of the second subset (**page 59, first set of matrix equations, page 57, section 4.1**) wherein K multiplies the v matrix which includes the second subset and wherein since these matrices are solved by an FEM solver, they must be stored in the memory of the simulation system that is solving the equations, and

(e) repeating steps a to d with regard to the second entity and a third entity, by a second simulation program (**page 57, section 4.1**) wherein the second system simulator uses the first simulation of the system model to further compute according to a third entity, f, the response of new terminal signals.

18. As to **Claim 2, Schwarz** teaches: the method as claimed in claim 1, further comprising:

a) accessing the first matrix and the second matrix (**page 57, section 4.1**) wherein the circuit simulator (system simulation) is coupled to the FEM simulator, and wherein the first matrix is the is the new net of independent terminal signals, and the second matrix is the response of the terminal signals calculated by the FEM simulator,

b) linking up of the first matrix and the second matrix for linking up the underlying vector models, and storing the linked-up first and second matrices as a system model (**page 57, section 4.1**), wherein the first matrix is the new net of independent terminal signals, and the second matrix is the response of the terminal signals calculated by the FEM simulator, therefore, the matrices and the underlying vector models are linked in order to be solved and stored as the system model.

19. As to **Claims 7 and 8, Schwarz** teaches: a computer program product on a computer-readable medium with computer-readable instructions for carrying out a method as claimed in claim 1 and a computer system programmed to perform the steps as claimed in claim 1 (**page 57, section 4.1**) wherein the simulators ANSYS and Saber are computer program products run on a computer to run the simulation.

Claim Rejections - 35 USC § 103

20. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

21. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

22. **Claims 3-6** are rejected under 35 U.S.C. 103(a) as being unpatentable over Schwarz as applied to claim 2 above, and further in view of Teng et al (Teng et al, "iTEM: A Temperature-Dependent Electromigration Reliability Diagnosis Tool", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, Volume 16, No.8, August 1997), herein referred to as **Teng**.

23. As to **Claim 3**, **Schwarz** teaches: a simulation method comprising
a) loading of a system model from a database created by a method as claimed in claim 2 (**page 57, section 4.1**) wherein the system simulation is run by Saber, therefore the system model must be loaded into the simulation program,
b) initialization of the simulation (**page 57, section 4.1**) wherein the system simulation is run by Saber, therefore the simulation must be initialized, and
d) storing of the simulation results (**page 57, section 4.1**) wherein the ANSYS simulator simulates the response terminal signals to be used by the system simulator, Saber, therefore, the simulation results from ANSYS must be stored.

24. **Schwarz** does not expressly teach calculating the simulation with boundary conditions taken into consideration.

25. **Tang** teaches electromigration diagnosis tools that uses a finite element analysis methods in their system simulator (**page 883, second column, last 2 sentences**) wherein the simulation of the vector models of the system includes a boundary condition (**page 884, second column, sentence 1**).

26. It would have been obvious to one of ordinary skill in the art at the time the invention was made that **Tang** and **Schwarz** are both directed to methods of solving electrical systems through the use of vector models and the inclusion of a FEM simulator within a system level simulator. Therefore, it would have been obvious to include a boundary condition as taught by **Tang** in the simulation of a system using

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the methods as taught by **Schwarz** if the methods taught by **Schwarz** are used to simulate electromigration.

27. As to **Claim 4**, **Schwarz** teaches: a simulation method as claimed in claim 3, in which the system model comprises only the first matrix (**page 57, section 4.1**) wherein the system model is the new set of independent terminal signals.

28. As to **Claim 5**, **Schwarz** teaches: a simulation method as claimed in claim 3, in which the system model comprises the linking up of at least the first matrix and the second matrix (**page 57, section 4.1**), wherein the first matrix is the new net of independent terminal signals, and the second matrix is the response of the terminal signals calculated by the FEM simulator.

29. As to **Claim 6**, **Tang** teaches: a method for presenting the results of a simulation comprising: loading results of a simulation method as claimed in claim 3, expanding of the results, and generating graphic output of the results (**Figure 21**), wherein the results of the simulation are shown on a plot. In order for this plot to be generated, the results of the simulation must be loaded into software that generates the graph, the results are expanded to connect or include points in between the points that the system has solved for to create a smooth curve, and the graphic output of the results are shown by the graph.

Conclusion

30. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mary C Hogan whose telephone number is 703-305-7838 until 10/28/04 or 571-272-3712 after 10/28/04. The examiner can normally be reached on 7:30AM-5PM Monday-Friday. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska can be reached on 703-305-9704. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mary C Hogan

Examiner

Art Unit 2123


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